**Testimony of Roger Brent, PhD**

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**Subcommittee on Prevention of Nuclear and Biological Attack**
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Chairman Cox, Ranking Member Thompson, Subcommittee Chairman Linder, Subcommittee Ranking Member Langevin, distinguished Members, it's an honor to appear before you to address issues related to engineered biological weapons, lessons from the US and Russian Cold War programs, and the consequences that modern developments in biology have for development of engineered biological weapons.

I'm from Hattiesburg, Mississippi, where I graduated from University of Southern Mississippi in computers and math. I went to graduate school in Cambridge, Mass., to learn molecular biology, and stayed at Harvard for 25 years. In 1997 I helped start Molecular Sciences Institute, a nonprofit public genomic research lab in Berkeley California. My faculty appointment is at UC San Francisco. The science we do is fundamental, but has broad applications to biology, medicine, and industry, for example to help biotech and pharmaceutical companies find drugs.

A lot of my work involves developing technologies, for example making little machines inside cells to tell you what is going on inside, and I'm kind of technology guy, You want to get something done in the lab, I can tell you good ways to do it and with luck think up and get working some new ones as well. Related, since 1987 I help write one of the main lab manuals, really kind of like a giant cookbook and or recipe book, Current Protocols in Molecular biology, that tells you how to work with get from point A to point B working with bacteria and viruses and DNA and cells. $600 bucks gets you a year's subscription, continually updated, almost 20 years in the public domain, 10,000+ subscribers worldwide.

Which is why I'm here today. By '95-'96 revalations from Iraq after the first Gulf war, combined with stories from scary people like Dr Alibek here, and a flow of information about Al-Quade had begun to terrify the US government about the danger from classical bioweapons and the increasing dangers of new ones. Beginning in 1997, I was tapped to to advise the Defense Department as to how to strengthen the nation's defenses against biological attack. As such, I continually receive in-depth briefings on the U.S. and former Soviet Union programs, trends in

offensive and defensive capabilities, and the public health system and been forced to think about the big picture and the strategic issues.

I'd like to make a few points about the threat and the defense against it.

1) There is a decentralized, Moore's law type, revolution in biological understanding and capability going n worldwide for more than half a century. In some cases, biotechnology is advancing faster than computer technology. For example, the density of components on computer chips continues to double every 18 months -- while certain abilities to read and write DNA double more like every 12 months. Just as with computers, revolutionary changes sustained over time have revolutionary consequences, and much of the first part of this century will reflect these changes breaking surface to impact human affairs. The US leads this revolution and benefits from its consequences, and it is likely that the ability to manipulate DNA will be as important to the economy of the 21st century as the ability to manipulate electrons and bits was to economy of the 20th century. The consequences of this revolution will help enable personalized medicines, longer, healthier lives for all Americans, clean energy that reduces our dependence on Middle East oil, and cures for the diseases that ravage the developing world such as AIDS, TB and malaria as well as an improvement its food supply

2) Unfortunately, the negative kinds of activities that this revolution in knowledge and capability constitute a sea change compared to the abilities that powered the US and USSR offensive biological warfare programs during the Cold War. Even through the early 1990s, a great deal of the activity in programs such as the one Dr. Alibek helped direct could be categorized as "microbiological process engineering", how to "weaponize" germs and viruses, coat them with agents that protected them from the environment, to make the disease causing particles rugged and controllable.

3) By contrast, there are tens of thousands of people worldwide who can now engineer drug resistant bacteria, and thousands with the ability to remake a virus like SARS, or perform other engineering tasks too numerous to mention. Their numbers will only grow, so I would not be surprised if, by 2010, there were more than 100,000 people worldwide who had the knowledge and access to the lab equipment they would need to use to make, say, anthrax resistant to Ciproflaxin. Since the breadth of dissemination of this technical knowledge base will only increase, if you assume that some of these people may be motivated to undertake these tasks, then you have to look at the next decades are a time of great and increasing risk. If you further assume that some individuals or groups may be motivated to use relatively crude deployment methods, at the limit including infecting themselves and spreading the disease by human transmission, then you have to figure that the increase in the risk is higher still. These projects could be carried out by individuals or small groups of people; there would be no need to recreate the Cold War programs of the nation states.

4) And its important to note that the potential mortality is enormous. When one uses the words terrorism or bioterrorism, they sometimes connotes local events, such as the horror in London. But remember that it would be possible to mount a coordinated attack spread by aerosol-- dust or fog from sprayers-- or by infecting members of a group with a contagious disease who initiate a multifocal ourbreak of a contagious disease transmitted human to human.

An attack with a contagious disease that circumvented existing defenses would not be confined to a single location but would be national and international in scope. An attack that killed 1% of the US or world human population would be a strategic disaster, a catastrophe only rivaled by the 20th century spectre of nuclear war. I believe it is the proper province of government to protect against such catastrophe.

5) Although its a good thing we have enough smallpox vaccine, and that we are working on a more modern anthrax vaccine, it's important to remember that stockpiles of vaccines and drugs are fixed defenses against known threats. There is a name for fixed defenses that can easily be outflanked. They are called "Maginot Lines". Because adversaries can and will outflank these defenses, in the end, by themselves, stockpiled defenses against specific threats will be no more effective to the defense of the US than the Maginot line was to the defense of France in 1940.

6) It is therefore important to move the US defense posture from one mainly based on fixed defenses against known or knowable threats to one that is complemented by flexible detection of new threats and agile responses to them. Effecting this change is a solvable problem but it is a complex one. Doing it right will require changes in strategy, policy, and institutions, and generation of a S&T base and an industrial structure that can provide the technical means to enable the shift.

7) Numerous elements of the defense effort, both policy, "soft power" elements, as well as technical elements, are naturally international in scope and will require broad international participation and support.

8) The US biology community, university, nonprofit, industry, is the best the world has ever seen. If it can be constructively engaged, it is entirely capable of protecting against the current challenges. But engaging this community and constructing this defense is a problem of such gravity and complexity that it will require R&D and policy efforts sustained over decades.

9) One consequence of the complexity of the problem that the defense effort needs to enjoy sustained, consensus, bipartisan support, both from the government, which will need to pay for it, and from the scientists, engineers and industrialists who will help execute it. We built and maintained such consensuses during the Cold War and they enabled us to get the job done.

10) Successful effort will pay back manyfold in increased security, better health and increased economic activity, and attention to right policy will help ensure that the US can capture the benefit of its investment in terms of new industries and economic growth.

I am attaching an article expanding on these topics that has been circulating in samizdat form in policy circles for almost two years. A version of it will be published in Tara O'Toole's biodefense journal later this year.